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EXAMINER	
KANG, INSUN	

ART UNIT	PAPER NUMBER
2124	

DATE MAILED: 12/22/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/844,345	ROBISON, ARCH D.	
	Examiner	Art Unit	
	Insun Kang	2124	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *21 July 2004*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-38* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-38* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

1. This action is in response to the amendment filed 7/21/2004.

2. As per applicant's request, claims 13, 27, and 37 have been amended. Claims 1-38 are pending in the application.

Specification

3. A brief summary of the invention is missing in the specification. See MPEP § 608.01(d).

Claim Rejections - 35 USC § 112

4. The rejection to claims 13, 27, and 37 has been withdrawn due to the amendment to the claims.

Claim Rejections - 35 USC § 101

5. The applicant's argument regarding the rejection to claims 1-14 is persuasive. Accordingly, the rejection to claims 1-14 has been withdrawn.

Claim Rejections - 35 USC § 102

6. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

7. Claims 1-38 are rejected under 35 U.S.C. 102(e) as being anticipated by Ruf (US Patent 6,077,313).

Per claim 1:

Ruf discloses:

pruning local graphs representing local problems ("A partitioning algorithm transforms the dependence relation by merging mutually dependent types in the dependence relation into single type representatives so mutually dependent program quantities will be analyzed in the same phase and therefore simultaneously by the dataflow analysis," col. 7 lines 25-33; col. 9 lines 40-48), the local problems corresponding to separately compilable components in a software program, each of the local graphs having edges and vertices, each edge having a transfer function, each vertex having a value ("Dependence analysis module ... represents each type in the dependence relation with a vertex or node in dependence graph ... and represents the dependence between each pair of types with a directed edge from the node representing the dependent type to the node representing the type upon which the dependent type depends. Each node in dependence graph ... may be labeled with the type represented by the node," col. 9 lines 40-48), values of each of the local graph forming a lattice under a partial ordering ("Each node of the collapsed dependence graph represents a type representative, and the resulting dependence graph is a directed acyclic graph (DAG) corresponding to a partial ordering of type representatives," col. 10 lines 1-10)

as claimed.

Per claim 2:

The rejection of claim 1 is incorporated, and further, Ruf discloses:

-associating a use attribute to each one of the vertices in each of the local graphs, the use attribute being asserted for each vertex reachable from a named vertex; associating an affect attribute to each one of the vertices in each of the local graphs, the affect attribute is asserted for a vertex if a named vertex is reachable from the former vertex; and pre-solving a subgraph of each of the local graphs (col. 12 lines 36-52), the subgraph including subgraph edges, each of the subgraph edges connecting a tail vertex to a head vertex, the tail vertex having a negated use attribute ("nodes 510, 520, as nodes of a strongly-connected component, are therefore collapsed into a single node... and directed edges...are removed to form a collapsed dependence graph," col. 12 lines 36-52) as claimed.

Per claim 3:

The rejection of claim 2 is incorporated, and further, Ruf discloses shrinking the local graphs("nodes 510, 520, as nodes of a strongly-connected component, are therefore collapsed into a single node... and directed edges...are removed to form a collapsed dependence graph," col. 12 lines 36-52) as claimed.

Per claim 4:

The rejection of claim 3 is incorporated, and further, Ruf discloses

- solving a global problem to optimize a recompilation of the separately compilation components by an inter-procedural analysis (IPA) solver, the global problem being represented by a global graph formed from the pruned local graphs ("For interprocedural data flow analyses, the dataflow solution for a function value determines, and is determined by, control flow edges between procedures," col. 17 lines 43-50) as claimed.

Per claim 5:

The rejection of claim 4 is incorporated, and further, Ruf discloses

- determining final edges and vertex values of the local graphs to be sent to IPA solver; and sending the final edges and vertex values to the IPA solver, the final edges and vertex values forming the pruned local graphs("nodes 510, 520, as nodes of a strongly-connected component, are therefore collapsed into a single node... and directed edges...are removed to form a collapsed dependence graph," col. 12 lines 36-52) as claimed.

Per claim 6:

The rejection of claim 2 is incorporated, and further, Ruf discloses

- negating use attributes for all vertices in the local graph; and invoking a mark use operation on u for each named vertex u in the local graph (col. 12 lines 36-52) as claimed.

Per claim 7:

The rejection of claim 6 is incorporated, and further, Ruf discloses

asserting the use attribute associated with u if the use attribute is negated; and recursively invoking the mark use operation on v for each edge connecting the named vertex u to a vertex v ("Dependence graph...therefore comprises directed edge...from node...back to itself...nodes 510, 520, as nodes of a strongly-connected component, are therefore collapsed into a single node... and directed edges...are removed to form a collapsed dependence graph," col. 12 lines 10-52) as claimed.

Per claim 8:

The rejection of claim 2 is incorporated, and further, Ruf discloses

negating use attributes for all vertices in the local graph; invoking a mark affect operation on y for each named vertex y in the local graph (col. 12 lines 1-2) as claimed.

Per claim 9:

The rejection of claim 8 is incorporated, and further, Ruf discloses

asserting the use attribute associated with y if the use attribute is negated; and recursively invoking the mark affect operation on x for each edge connecting the vertex x to a named vertex y (col. 12 lines 10-52) as claimed.

Per claim 10:

The rejection of claim 2 is incorporated, and further, Ruf discloses finding a greatest fix-point solution to the subgraph (col. 15 lines 18-44) as claimed.

Per claim 11:

The rejection of claim 3 is incorporated, and further, Ruf discloses removing an incoming edge having a head value of a lattice-bottom("Dependence graph...therefore comprises directed edge...from node...back to itself...nodes 510, 520, as nodes of a

strongly-connected component, are therefore collapsed into a single node... and directed edges...are removed to form a collapsed dependence graph," col. 12 lines 10-52) as claimed.

Per claim 12:

The rejection of claim 3 is incorporated, and further, Ruf discloses transforming a subgraph having first and second edges, the first and second edges having first and second functions, the first edge connecting a first vertex to an anonymous vertex having a value v, the second edge connecting the anonymous vertex to a second vertex having a value w (col 15 lines 3-17) as claimed.

Per claim 13:

The rejection of claim 12 is incorporated, and further, Ruf discloses removing the anonymous vertex; removing the first and second edges; adding a third edge having a third function and connecting the first and second vertices, the third function being combined by the first and second functions; and changing value of the second vertex to a lattice meet of the second function of the value v and the value w ("Dependence graph...therefore comprises directed edge...from node...back to itself...nodes 510, 520, as nodes of a strongly-connected component, are therefore collapsed into a single node... and directed edges...are removed to form a collapsed dependence graph," col. 12 lines 10-52) as claimed.

Per claim 14:

The rejection of claim 15 is incorporated, and further, Ruf discloses determining each of the final edges as edge having asserted use and affect attributes for tail and head vertices, respectively; and eliding each of the vertex values having a top value (col. 12 lines 10-52) as claimed.

Per claims 15-28, they are the computer program product versions of claims 1-14, respectively, and are rejected for the same reasons set forth in connection with the rejection of claims 1-14 above.

Per claims 29-38, they are the system versions of claims 1-5 and 10-14, respectively, and are rejected for the same reasons set forth in connection with the rejection of claims 1-5 and 10-14 above.

Response to Arguments

8. Applicant's arguments filed 7/21/2004 have been fully considered but they are not persuasive.

Regarding the objection to the specification, the applicant refuses to add the brief summary of invention because "37 CFR §1.73 does not state must or shall." In response, 37 CFR §1.73 also does not states that Examiner should not object a specification when the brief summary of invention is not present. Therefore, the objection to the specification is maintained.

Per claims 1, 15, and 29:

The Applicant states that :

1) Transforming and/or merging is not the same as pruning. Pruning is in essence reducing whereas merging is combining. The two processes are different.

In response, the examiner points out that the instant specification recites, "Local inter-procedural problems are constructed for each translation unit, reduced, and merged together into a global problem to be solved (0034 page 8)." Further, Ruf specifically states that "Partitioning algorithm module...may merge suitable type representatives of the ordered dependence relation into a single type representative to help reduce execution time and/or memory space costs in performing the dataflow analysis (col. 10 lines 47-60)." Therefore, merging includes reducing in Ruf's partitioning algorithm, accordingly, it helps "reduce peak storage requirements for the dataflow analysis (col. 10 lines 31-47).

2) Ruf does not disclose local graphs representing local problems corresponding to separately compilable components. Ruf merely discloses a dependence graph...Since the vertex/node represents a type, it does not correspond to separately compilable components in a software program.

In response, Ruf states, "Dataflow analysis dependencies may be determined ...for types representing functions (col. 3 lines 1-5)." A function is the smallest separately compilable programming construct. Therefore, a type in Ruf corresponds to "separately compilable components in a software program" as it also represents a function.

3) Ruf does not disclose values of the local graph form a lattice under a partial ordering. Ruf merely discloses a directed acyclic graph (DAG) which represents a collapsed dependence graph.

In response, the applicant simply states that Ruf does not disclose the limitation, values of the local graph form a lattice under a partial ordering, in the claims and fails to show why the limitation is different from the teachings of Ruf. Further, as recited in the instant application (0038, page 9), "partial orders are lattices" and a "lattice is partial ordering." Ruf's directed acyclic graph is corresponding to a partial ordering of types, which represents functions (col. 10 lines 1-10). Therefore, Ruf discloses that values of the local graph form a lattice under a partial ordering.

Accordingly, in view of the broadest reasonable interpretation above, Ruf discloses the limitations in the claims. Therefore, the rejection of the claims is considered proper and maintained.

Conclusion

9. THIS ACTION IS MADE FINAL. Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

10. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Insun Kang whose telephone number is 571-272-3724. The examiner can normally be reached on M-F 9:30-6.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Kakali Chaki can be reached on 571-272-3719. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

I. Kang
Patent examiner
12/10/2004

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